

Name \_\_\_\_\_

Special Art Design Line Project (Regular Geometry):


Read and follow directions on pages 118 – 119. You will not be expected to hand in the forty-five degree angle. You are expected to hand in the following:

1. Two fifty degree angles: The first with ten points on each line segment spaced with each unit measuring .5 cm, and a second with fifteen points on each line segment spaced with each unit .5 cm apart. Write a comparison paragraph between 10 points and fifteen points. Then complete string flings on handout.
2. Create a design of your own using one of the following: (No project should be larger than an 8 1/2 X 11 piece of paper.)
  - A. A type of wood loom, using nails as the points on the angle, may be a square or rectangle, and using yarn or colored string as the design element.
  - B. A piece of cardboard (thickness of a folder or cereal box) with a needle and colored thread as part of your design element.
  - C. A plain piece of paper 8 1/2 by 11 and colored pens or pencils, this must cover the entire piece of paper with your design. This draw version will insure a grade of a C but you must use string art for a better grade.
3. Include your finished rough draft, or design idea before you begin your final project \_\_\_\_\_. Include a name of your picture on your finished project.

Rubric:

1. \_\_\_\_\_ +3 points for creativity
2. \_\_\_\_\_ +2 points for neatness
3. \_\_\_\_\_ +10 for completion of step 1 above
4. \_\_\_\_\_ +15 for completion of step 2 above
5. \_\_\_\_\_ -5 will automatically be deducted per day for late work.
6. \_\_\_\_\_ Total out of 30 points

This paper must be submitted with your project. !!!



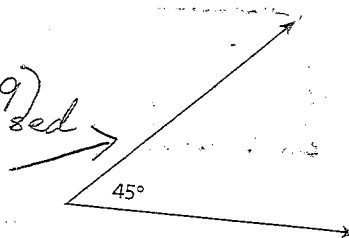
# SPECIAL PROJECT

## Line Designs

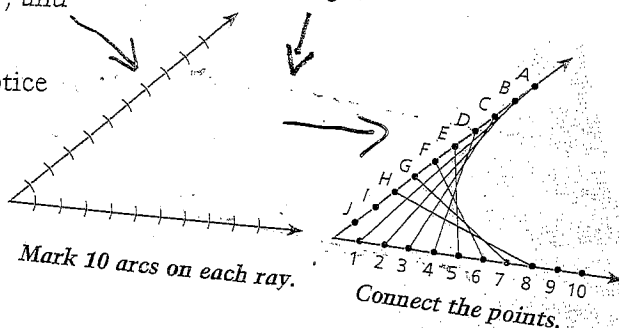
(pg 118-119) condensed

A line design can be made using a compass, straightedge, and protractor. To make the design shown below, begin by drawing a  $45^\circ$  angle. Use your compass to mark ten equally spaced arcs on each ray of the angle. Label the intersections of the arcs and rays as A, B, C, ..., and 1, 2, 3, ..., as shown in the third diagram.

To create the design, connect 1 to A, 2 to B, 3 to C, and so on. Notice that a curve begins to appear as more segments are drawn.

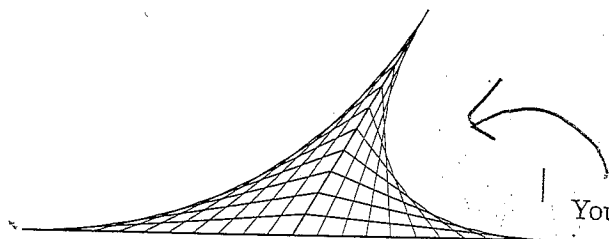


Draw a  $45^\circ$  angle.

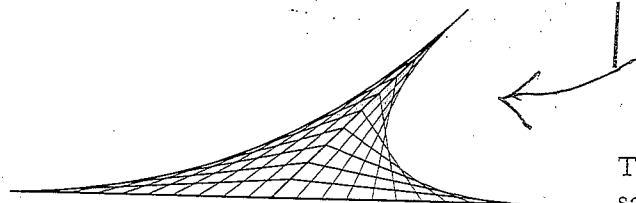


Mark 10 arcs on each ray.

Connect the points.



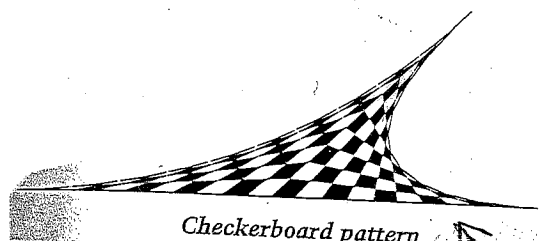
$120^\circ$  and  $60^\circ$



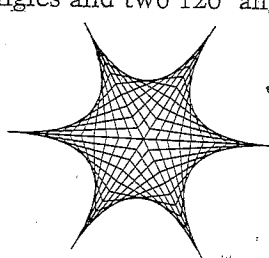
$135^\circ$  and  $45^\circ$

You can extend the design by using supplementary angles. For instance, in the drawing at the left below, a  $135^\circ$  angle was drawn with the same vertex as the  $45^\circ$  angle. By altering the measures of the angles, you will obtain different curves, as shown in the examples below.

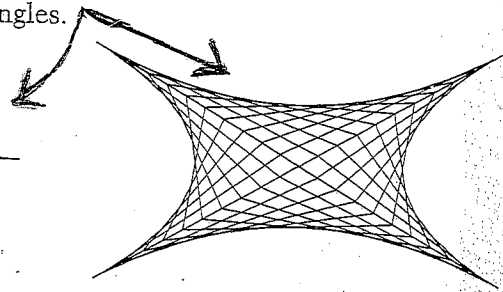
To make a design about a point, begin with several rays that have the same vertex. For instance, the design at the left below was constructed with six  $60^\circ$  angles, and the design at the right below was created using two  $60^\circ$  angles and two  $120^\circ$  angles.



Checkerboard pattern

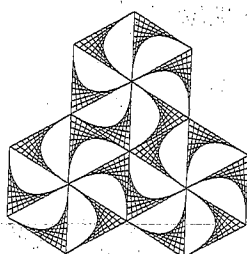
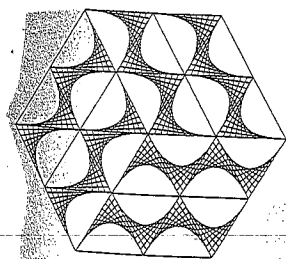


Six  $60^\circ$  angles



Two  $60^\circ$  angles and two  $120^\circ$  angles

By shading your design, you can create different illusions. Two commonly used shading techniques are shown below. The left design uses a checkerboard pattern, and the right design uses a mirror pattern. Can you see the difference in the two patterns?

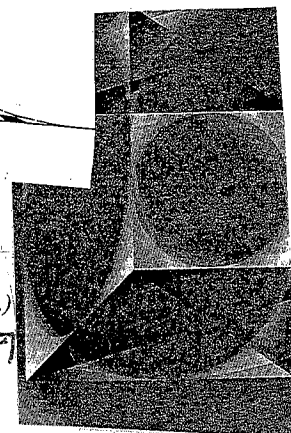


Line designs can be used to create artwork. Each of these three designs uses tiling, in which a smaller design is repeated several times.

## Exercises

1. Create a line design that uses a  $50^\circ$  angle. Compare the design obtained with ten points on each ray with the design obtained with 15 points on each ray. (Draw the points about  $\frac{1}{2}$  centimeter apart.)
2. Use a line design technique to create a piece of art. You can use colors and shading. Title your finished product.

This painting, titled *Tesseract*, was painted in 1966 by the American artist Ben Cunningham. (A tessera is a small tile used to make a mosaic.)



# Manipulative Worksheet

## String Flings

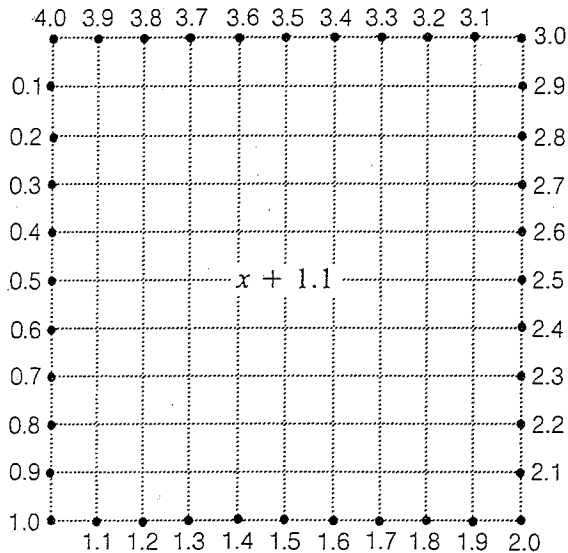
For use with Lesson 4-9.

Name \_\_\_\_\_

Date \_\_\_\_\_

Connect points with a straightedge, or paste the designs on cardboard and use a needle and thread to join the points.

**Before you begin:** you will need a straightedge or scissors, paste, cardboard, one needle, and string or colored thread.



For the design above, use this expression to connect the points:

$$x + 1.1$$

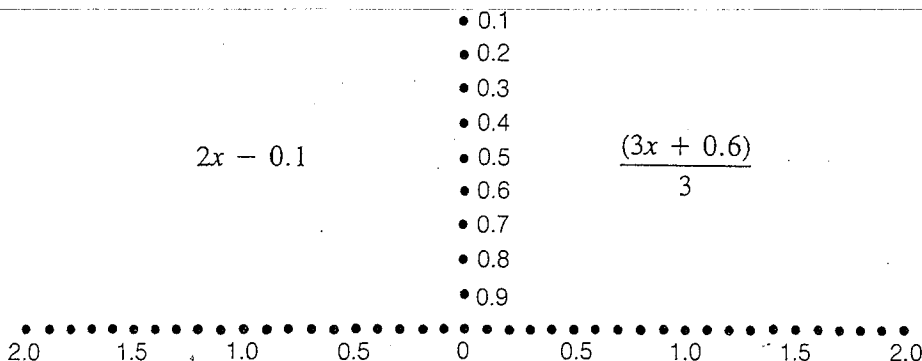
Start in the upper left at point 0.1. Evaluate the expression for  $x = 0.1$ :

$$\begin{aligned} x + 1.1 &= \\ 0.1 + 1.1 &= 1.2 \end{aligned}$$

Connect 0.1 with 1.2.

Go on to the next point, 0.2. Substitute it into the expression to find out what point it should be connected to. Repeat until no more points can be connected.

For the design below, use the vertical points (0.1–0.9) for your “ $x$  values.” Substitute these into the expression  $2x - 0.1$  to join them to points on the left-hand side of the drawing; use the expression  $\frac{(3x + 0.6)}{3}$  to connect them to points on the right-hand side of the drawing.



## Lesson 0.2 • Line Designs

You can use straight lines to create designs that appear to curve. On page 8 of your book is a line design called the *astrid*. In this activity, you'll learn how to use Sketchpad to create a dynamic version of the astrid.

### Investigation: The Astrid

#### Sketch

In Steps 1–10, you'll construct two segments with a common endpoint and equally spaced points along them.

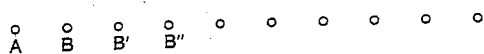
**Step 1** In a new sketch, construct point *A* and another point, *B*, just to the right of it.

**Step 2** Select, in order, point *A* and point *B* and choose **Mark Vector** from the Transform menu.

**Step 3** Select point *B* and choose **Translate** from the Transform menu. Translate by the marked vector to construct point *B'*.

**Step 4** Translate point *B'* by the same marked vector to construct point *B''*. Keep translating the most recently constructed point until you have about ten points in a line.

**Step 5** Drag point *A* and point *B* to see how they affect the other points.



Steps 1–5

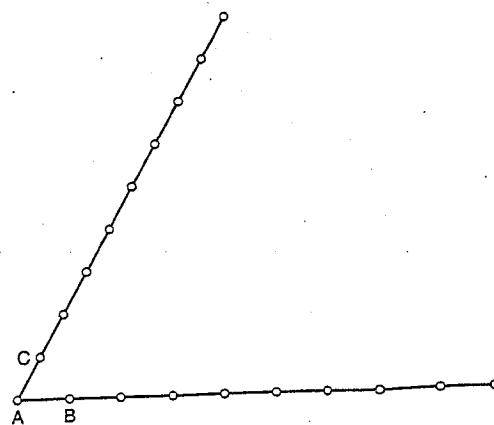
**Step 6** Construct point *C* above point *A*. (Point *C* should be about as far from point *A* as point *B*.)

**Step 7** Select, in order, point *A* and point *C* and choose **Mark Vector** from the Transform menu.

**Step 8** Translate point *C* by this marked vector and repeat to construct the same number of points as you constructed in the direction of vector *AB* (about ten).

**Step 9** Drag point *C* to see how it affects the other points.

**Step 10** Draw a segment from point *A* to the last point at the end of each row of points.



Steps 6–10

**Step 11** Draw segments to connect the points as shown.

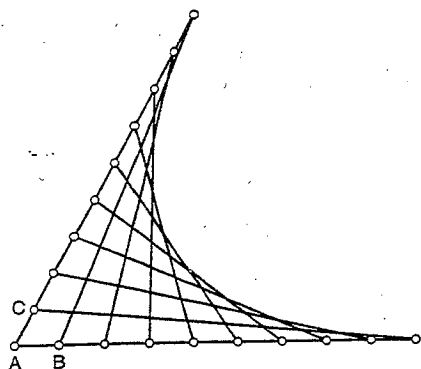
**Step 12** Hide all the points except points *A*, *B*, and *C*, and add color to the lines in your design by choosing **Color** from the Display menu.

**Step 13** Double-click on the segment that passes through points *A* and *C* to mark it as a reflection mirror.

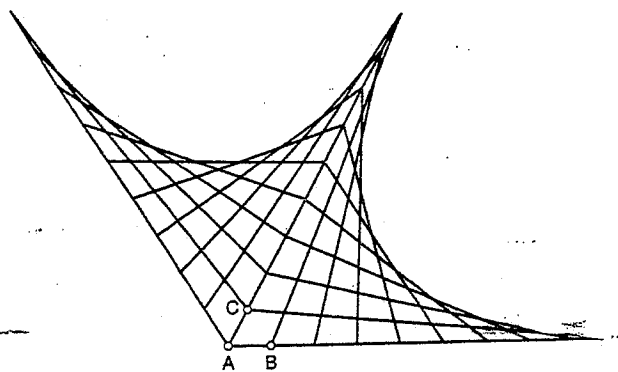
(continued)

## Lesson 0.2 • Line Designs (continued)

**Step 14** Select all the segments and choose **Reflect** from the Transform menu.



Step 11

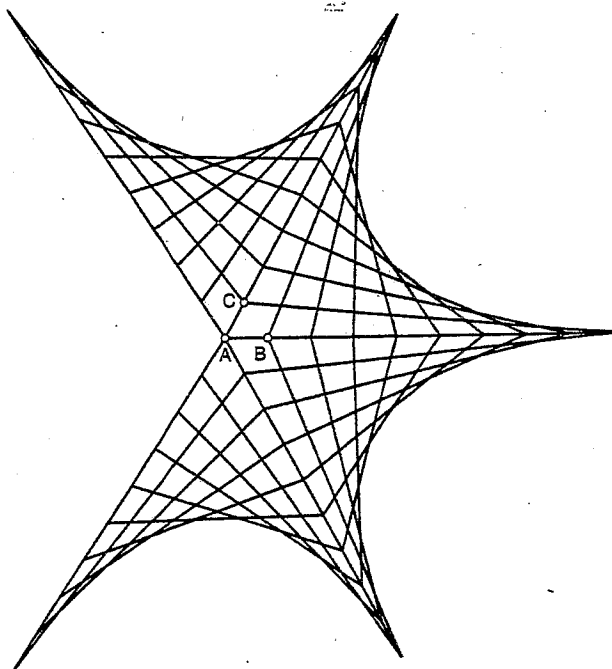


Steps 12-14

**Step 15** Double-click on the segment that passes through points A and B to mark it as a mirror; then reflect all the segments again to make a design like the one shown here.

### Investigate

1. This design has just one line of symmetry. Where is it?
2. Drag points A, B, and C to see how they change your design.
  - a. Manipulate your design so that it has exactly two lines of symmetry. Describe the lines.
  - b. Manipulate your design so that it has four lines of symmetry. Describe the lines.
  - c. Manipulate your design so that it has three lines of symmetry. Describe the lines.



Step 15

### EXPLORE MORE

Open a new sketch and experiment with this method or other methods to make different line designs.